Inventory & Monitoring
Pacific Island Network

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Aliens. Are they in your backyard ?

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The National Park Service (NPS) has implemented natural resource inventory and monitoring on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based management, decision-making, and resource protection.

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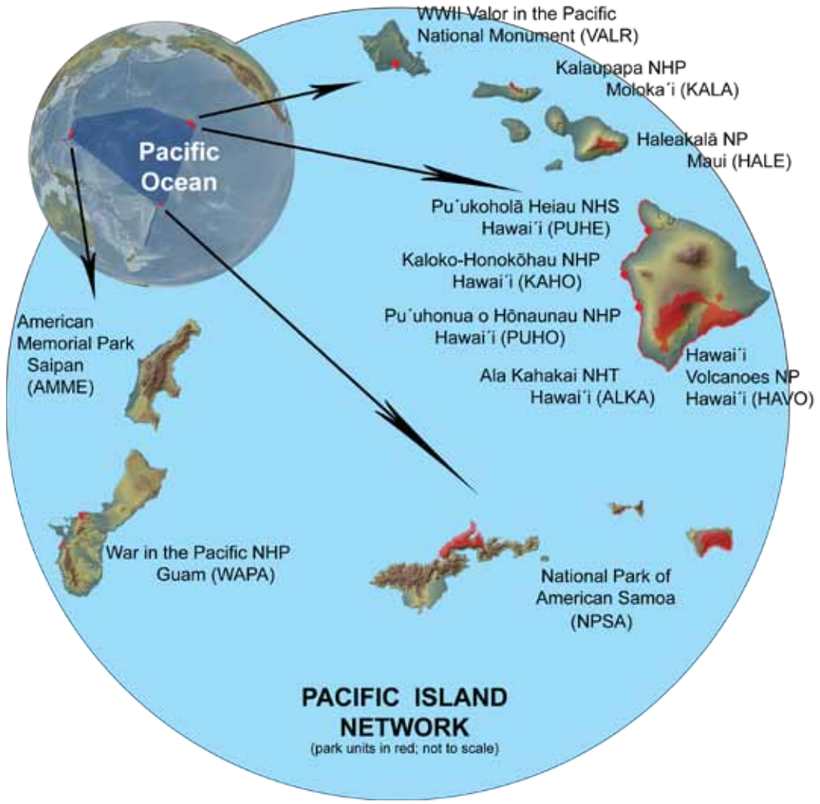


Monitoring Schedule

April
Water Quality Monitoring at KAHO and HALE
Vegetation mapping accuracy assessment at WAPA
Vegetation mapping data collection at HAVO and HALE
Plant Community and Invasive Plant Species Monitoring at HAVO (subalpine)

May
Water Quality Monitoring at PUHO, PUHE, AKLA, KALA, WAPA and AMME
Groundwater Monitoring at KAHO and AMME
Marine Fish and Benthic Marine Monitoring at WAPA
Vegetation mapping field data collection at HALE
Plant Community and Invasive Plant Species monitoring at HAVO (subalpine and wet forest)

June
Water Quality and Freshwater Animals Monitoring at NPSA
Landbirds monitoring at NPSA
Vegetation mapping data collection at HALE
Plant Community and Invasive Plant Species Monitoring at HAVO (subalpine and wet forest)

EXTRA!

Rare Baby Turtles Faced Certain Death: Saved by Volunteers !

In the dawn light on November 9, Hawksbill Turtle Project volunteers were checking a black cinder and green olivine sand beach on South Hawai'i Island for signs of hawksbill turtles. There were already at least three hawksbill nests being protected in the area. They discovered a nesting sea turtle laying her eggs in the sand in the tidal inundation zone. However, this was not a hawksbill or its more common cousin, the green turtle. This nesting female was small with a heart-shaped shell; it was an olive ridley sea turtle (*Lepidochelys olivacea*). With the tide rising and a strong shorebreak, the volunteers had to act fast to move the eggs to higher ground before they were washed away. After the turtle nested, they placed tags on her flippers before she returned to the ocean. Then they excavated the nest and carefully placed the 88 ping-pong ball size eggs into a container and moved them away from the surf. Finally, they constructed an egg chamber and gently re-buried the eggs in the sand in front of a patch of morning glories.

Hawksbill Turtle Project personnel monitored and protected this nest for the next two months while the eggs were incubating. They informed and educated beach users about the nests. Then, 56 days later on January 4, a depression formed on top of the sand with the emergence of 76 keiki turtles. These hatchlings slowly climbed out of the nest and crawled across the starlit sand into the ocean. Four more hatchlings came out in the following days. Eighty hatchlings out of the 88 total eggs made it safely to the ocean for a 90% nest success rate. None of these hatchlings would have survived without help from the dedicated volunteers.

This is only the fourth documented olive ridley nesting event in Hawaii State history. Listed under the Endangered Species Act as a threatened species, olive ridleys occasionally stray into Hawaiian waters. However, they typically nest in the eastern Pacific off of Mexico and Central America during the daytime in a mass nesting event called arribada, where thousands of females come to shore to lay their eggs. We're happy to have just one.

—W. Seitz, Hawksbill Turtle Recovery Project Coordinator

1. An olive ridley sea turtle crawls onto a beach on south Hawai'i Island to nest. This marks only the fourth time this species is known to have nested in Hawaii.

2. The turtle digs a hole and lays her eggs in the tidal inundation zone. The eggs may be lost at high tide.

3. Vigilant volunteers looking for hawksbill turtles see the doomed nest and take action.

4. The eggs were removed from the nest and placed into a makeshift carrier to be relocated to a safer site nearby.

5. Hatchlings emerge one night, 56 days after the relocation. Ninety percent of the eggs hatched and those hatchlings made it to the ocean.

6. Project personnel excavate the nest several days after natural emergence to free remaining hatchlings trapped inside, and to collect data and genetic samples.

In mid-January, the final remaining hawksbill nest was excavated marking the end of another long and successful field season. 2010 marked the 21st anniversary of the Hawai'i Island Hawksbill Turtle Recovery Project, a volunteer program started by Hawai'i Volcanoes National Park. Between April and January, 40 (39 hawksbill and 1 olive ridley) nests were documented and protected from 13 mama turtles at six different beaches along the southern coastline of the island. Close to 4,000 hatchlings are estimated to have reached the ocean with help from over 40 volunteers who tirelessly monitor the nesting beaches. The Hawksbill Project wishes to extend a huge mahalo to the Big Island community for their continued support of sea turtle conservation efforts.

And Then it Rained

The mission appeared simple enough as I read the list a second time. A drizzle grayed the light filtering through the small basement windows of the Inventory & Monitoring Aquatic Office. Fly to Guam for a day, calibrate some instruments, then head to Saipan and train the new Resource Chief on Groundwater and Water Quality Monitoring in American Memorial Park. All the while, actively collecting water samples, setting up instruments for counting bacteria in the water, and training park staff. Two days were reserved to accomplish that. There may even be time for a stop at my favorite Vietnamese restaurant for dinner. After that assignment, I was to head back to Guam, and begin stream monitoring in earnest. The plan included sixteen monitoring sites in ten days; sampling along the scenic Asan River in War in the Pacific National Historical Park. Thrown in the mix was a day off for rest and a day to set up bacteria counting instruments. Another day was scheduled to meet with USGS scientists to establish sites along the Asan River for a stream rating curve to understand stream discharge. What could be better? Diving! That was on the mission list as well. I was to work with national park staff in Guam to get them approved to conduct their own scientific diving research. This was shaping up to be an excellent mission. The last task on the mission list was to meet a pair of experts flying in from halfway around the world, and spend a week with them working on developing a stream animal identification guide for the island. Who wouldn't want to spend time with that kind of brain power? We would fly in January.

The jet lifted off into the clear blue sky, engines humming in the background, speeding me at 540 miles per hour towards the Mariana Islands in the Western Pacific. The landing was smooth, but the blackness of the night had a foreboding feel that haunted me worse than the heat and humidity in the air which stuck to my skin and drained my last remaining bits of energy... Morning struck sooner than desired. 7:00 am Hawaii time was 3:00 am Guam time, and no amount of effort could force me back to sleep. It was time to work. Locating gear and conducting calibrations took all day, but by 7:00 pm we had finished and were prepared for the next morning's flight to Saipan. Travel there was uneventful, and the cool blue ocean sparkled as the islands of Rota and Tinian, and their fringing coral reefs, slipped beneath us in silence.

Then the trouble began. At the first monitoring site on Saipan the groundwater probe had failed. Then several water quality sites were dry. Then an extended deployment instrument was lost under a sea of water hyacinth. Not a good couple of days. The minutes spent rectifying each situation stretched into hours. The precious moments of sleep refused to rest the wearied souls of all who participated. A frantic drive back to the airport to make the last flight of the night found us without our documentation camera and no time to look for it. We returned to Guam, happy with the successes that we had, but troubled by the equipment failure and loss.

Guam didn't turn out much better. The rains started to come and the streams started flooding. The Asan River became unsafe to work in, so we had to divert more precious time to secondary objectives developed for such situations. The stream receded and we started work until we had to meet the USGS scientists. We made it to the first site safely, but at the next site the stream started flooding again. The river rose so quickly that within minutes the stream had gone from dry rocks to low calf level and it was still rising. We slogged our way back through brush and thick mud bogs created by the erosion from a development above the park. We bided our time with more secondary objectives. The river dropped and we recommenced our monitoring. Our GPS unit failed, and we had to briefly resort to topography maps to identify locations. Swordgrass cut and sliced our hands and faces and skin. Not many days went by until we were hampered by flooding again. Diving was rescheduled, and the weekends were booked.

The staff of War in the Pacific NHP valiantly pitched in to help. Even the Administrative Assistant was in the stream with mask and snorkel, slithering to and fro, cold and wet, searching for snails and shrimp so that we might be able to complete our efforts to monitor the freshwater animals of the national park.

Still the rains kept coming. We did everything we could to alter our schedule and work on the intermittent sunny days, garnering help from every corner of the island. The Navy sent 10 people to assist us. They worked hard to help us press forward in our efforts. Slowly but surely, the sites seemed to melt away into the completed pile. But, before we could finish, the experts from the other side of the world showed up. We divided our efforts, but on the day they arrived the rains came again and flooded us out of the streams we were supposed to be working in. The next day was no better than the first. Try as we might, we couldn't find a stream on the island that wasn't flooding. We headed for the safety of the caves.

And then it hit me. **There I was, soaking wet, muddy, cold and deep within a cave on the island of Guam, half a globe from home, cheering that we had just caught a crab. It was a long way from the deserts of Arizona where I was raised.** If only Mom could see me now.

Perseverance paid off with our first glimmers of hope. We received word that the camera we'd lost on Saipan had been found. Then, the sunlight broke through and the Navy sent 10 more brave young soldiers to help us with our last push efforts to succeed. And succeed we did. We finished the sampling and took the national park staff for their science diving checkout. We packed water samples, and finished the last of our work, hours before our plane left for Hawaii. And there we were; waiting for the plane; exhausted. Only 3 days off in almost a month of working 7 am to 7 pm. But, the project was complete. The mission was successful. And the plane, well, the plane slipped into oblivion as I lost consciousness minutes after we departed. The emerald green of the Big Island greeted me when I awoke, and beckoned me home.

— T. Jones, Aquatic Ecologist

Aliens Among Us

There is far more to Hawai'i Volcanoes National Park than what lies along the trails and roads which give most park visitors easy access to the natural and cultural resources that make this place so amazing.

In fact, I often find myself longing for one of those smooth jungle trails through an easily accessible area when I'm up to my waist in a massive volcanic crack, being consumed by ferns that, while they aren't carnivorous, can still engulf a person whole.

Dense tangles of ferns may seem like something out of a sci-fi movie, but the Inventory and Monitoring invasive plants field team encounters them on a regular basis. The main culprit, uluhe, seems like an alien (non-native) species, but it is actually a prolific native fern.

When my team and I see blankets of uluhe we know that we aren't going to encounter too many weeds; more appropriately called invasive species. Uluhe grows so thick in some areas of the park that, when undisturbed, it often prevents the establishment of invasive species in those areas. Unfortunately, much of the native forest has been disturbed by people and invasive animals. Many invasive species have become established in certain areas of the park.

Hawai'i Volcanoes NP resource management staff is in a constant battle with invasive species. In order to prioritize control efforts, park managers need to know the location and abundance of invasive plants within the park's most intact native plant communities. That's where my team enters the picture. The team consists of biological technicians, volunteers, and me, the Field Crew Leader. We travel to the far reaches of the park, including some of the most remote sections, to look for invasive plants and record the extent that they have become established.

While we utilize existing roads, trails, and fences to access the locations we need to reach, these paths usually only bring us a little closer to our required destinations. Sometimes the only way to access an area is to be dropped off by helicopter on old lava flows that parallel the edge of the forest.

It can take us 3-4 hours of climbing over tree stumps and under tree ferns just to reach the locations where we conduct our invasive plants surveys.

Since we can't measure every invasive species in the forest, we conduct sample surveys along transects (straight lines) randomly scattered throughout each plant community type. In the wet forest at Hawai'i Volcanoes NP, each transect is 1000 meters long and 5 meters wide. Every 200 meters along the transect we record a GPS point and take a set of photos. Half of the transects are flagged every 20 meters and permanently marked so that they can be resurveyed in five years. The other transects are not marked because they will never be revisited by the monitoring team.

On both permanent and temporary transects, we record all non-native plant species observed within each 20x5 meter section along the transect. We also estimate the percentage of area that each species occupies to provide park managers data on invasive species dominance within these forests.

By collecting consistent data on these surveys, we can provide useful information to National Park Service resource managers so that they can respond as necessary with effective management practices to remove, control, or contain invasive species.

Furthermore, by monitoring in the same area using the same methods every five years, we can measure changes in distribution and coverage of existing invasive species, and identify any new invaders as they arrive.

Invasive plant species present a serious threat to Pacific island ecosystems. Invasion by alien plants reduces native plant diversity and abundance, and alters plant community structure. It can also lead to significant economic and cultural costs. For example, imagine if an alien invasive grass spread like wildfire around the iconic Halema'uma'u crater in Hawai'i Volcanoes NP. The cultural and visitor experience of that sacred place would be dramatically compromised.

As the invasive plants monitoring team, it is our pleasure to go out each day in spite of volcanic cracks, mosquitoes, ferns and whatever else the forest presents us. Our ultimate goal is to promote the long-term health of the ecosystem by collecting this vital piece of the big picture for our national parks.

— A. Mehlhorn,
Vegetation Field Crew Leader

See the field team in action and learn more about monitoring invasive plants at:
http://www.youtube.com/user/PACN2011#p/u/6/c6j7qhdxia8

Invasive Plants Will Be Monitored in a Park Near You !

Hawai'i Volcanoes National Park – wet forest (2010-2011)
Hawai'i Volcanoes National Park – Kahuku unit (2011)
Haleakalā National Park (2012)
Kalaupapa National Historical Park (2012)
National Park of American Samoa (2013)
American Memorial Park (2014)

Cycle repeats at Hawai'i Volcanoes National Park (2015)

Highly invasive kāhili ginger (top) takes over habitat once dominated by the native uluhe (bottom).

While blending into the native 'ōhi'a forests, faya trees gradually change the soil chemistry which discourages new 'ōhi'a trees from the habitat, thereby changing the forest over time.

Invasive plants monitoring Biological Technician, Koa Awong, takes a breather during a survey.

Invasive plants monitoring Field Crew Leader, Adam Mehlhorn, goes over some survey notes while engulfed in a dense patch of uluhe.

Weather Data and Updates

Weather and climate influence all other monitoring efforts, so it is very important for the Pacific Island Network (PACN) to get good data from our weather stations. Good data means collecting data more than 85% of the year (300 days or more). Although records for all weekdays, consistent across a year, can still be analyzed with statistical interpretation, it is best to include weekends. Also, the importance of a permanent location for an individual weather station can't be overemphasized. All long-term data is only of value if the station never moves.

The PACN primarily relies on two kinds of weather stations; COOP (Cooperative Observer Program), and RAWS (Remote Automated Weather Stations). COOP stations are manned by specific personnel and gauges need to be read daily. RAWS stations send data via satellite to WRCC (Western Regional Climate Center) for validation and are then downloaded to the web, where we can retrieve it for our specific analyses.

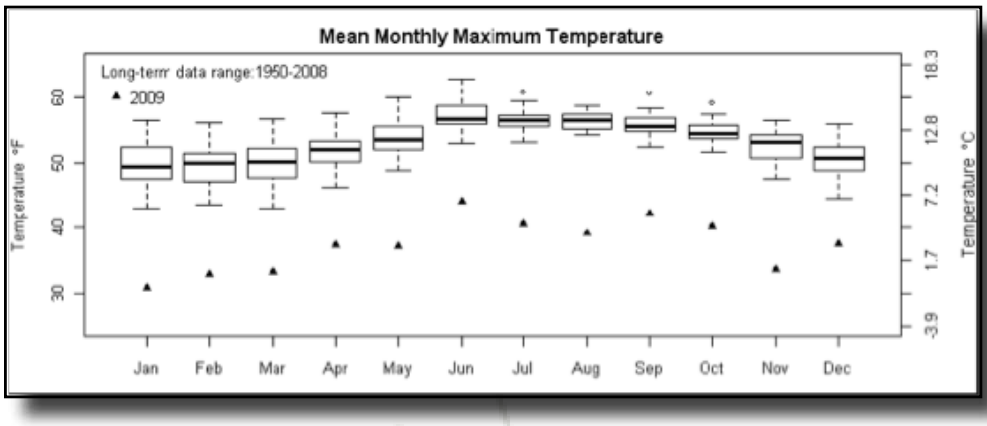
The PACN has recently obtained nine new weather stations, made by Campbell Scientific, Inc. (CSI). WRCC personnel are setting these up on the RAWS network, and they need to be maintained by PACN/park personnel.

Four new stations are being set up on Hawai'i island. Two are destined for the Kahuku unit of Hawai'i Volcanoes NP. The two remaining Hawai'i Island stations are Pu'ukoholā NHP and Pu'uhonua o Hōnaunau NHP bound. Two more CSI stations head to Kalaupapa NHP, two to the NP of American Samoa, and the last to American Memorial Park. All stations will be operational by fall 2011.

Kaloko-Honokōhau NHP has a major weather mystery where two stations, one RAWS and one COOP, are located only 2,700 meters apart. Amazingly, the difference in 2009 precipitation between the two stations was 4.9 inches; a 26% difference! 2008 data was equally bizarre. An investigation into why two stations so close to one another have such different precipitation readings needs to be conducted.

The volcanic plume from Halema'uma'u (Hawai'i Volcanoes NP) influences weather patterns downwind.

Another weather aberration occurs at the Mauna Loa Slope Observatory where weather data is taken five days per week, all year long. 2009 data, compared with long-term data collected at the observatory is markedly interesting.



Mean monthly maximum temperature is recorded at Mauna Loa Slope Observatory at 3,401 meters elevation.

A careful look at the above graph reveals temperatures approximately 10°F lower than the lowest mean temperature from 1950-2008. We have no explanation for the differences, and nothing points to a malfunction in the equipment. This anomaly will make the 2010 data very interesting to analyze.

—T. Casey
Biological Science Technician

Another weather tidbit:
Hawaii's warmest months are not June and July, but August and September. Its coolest months are not December and January, but February and March, reflecting the seasonal lag in the ocean's temperature.

Remember! Whether it rain, or whether it snow! We must have weather, whether or no. Whether it's cold or whether it's hot! We must have weather, whether or not. (Farnham,1936, A Place in the Country, Funk and Wagnall's).

Background:
New CSI weather station